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Multifunctional Roles of Green Innovation Approaches and Industry 5.0 Concert Management for Sustainable Growth in the Automotive Sectors

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ABSTRACT

This study examines the automotive industry's focus on green innovation to achieve sustainable development. The survey had 200 participants from organizations of all sizes, including small, medium, and large. It revealed a significant positive correlation ($r = 0.92$, $p < 0.001$) between green innovation practices and pressure from consumers, authorities, competitors, and previous units. In addition, a positive correlation was seen between green innovation methods and both innovation orientation ($r = 0.91$, $p < 0.01$) and performance management ($r = 0.91$, $p < 0.01$). The mediation investigation provided data that supported hypotheses H1, H4, H5 and H8. Industry 5.0 significantly affects the relationship between green innovation methods and environmental performance, with an indirect effect of $\beta = 0.85$, $p < 0.001$. Principal component analysis (PCA) showed innovation orientation and environmental regulation as important factors that explained 72.1% of the variation in green innovation practices. The results suggest that the adoption of Industry 5.0 and green innovation techniques can significantly influence employee behavior and environmental performance. Management organizations and industry leaders can use these results to implement sustainable practices.

1. Introduction

Minimizing greenhouse gas emissions can mitigate the impacts of the enormous environmental disasters currently being witnessed around the world, including devastating floods [1], widespread hunger [2], and the phenomenon of global warming [3]. Companies must find a way to maintain both economic stability and sustainability in their strategy, as they have an important responsibility in addressing these environmental challenges [4, 5]. Green innovation strategies, such as the

conservation revolution, the bearable revolution, the ecological revolution, and the green innovation strategy, offer a path to achieving environmental sustainability [6]. However, implementing these tactics can be disconcerting and costly [7]. Industry 5.0 offers a possible solution by combining the efforts of robots and humans collaboratively [8, 9]. This study investigates the flexible characteristics of Industry 5.0 and green innovation methods to establish administrative performance management. Explore the potential of these advanced concepts to transform the sector and promote sustainability.

As a result of seasonal fluctuations and devastating floods caused by global warming, ecological disasters have become a major danger [10]. Rising global temperatures are causing the polar ice caps to melt, leading to rising sea levels and an increased frequency of catastrophic disasters [11]. This represents a significant danger to ecosystems, economies, and human cultures [12]. Companies must adopt sustainable practices and reduce their greenhouse gas emissions [13]. This requires moving away from traditional approaches and adopting innovative and lasting solutions [14]. Green innovation methodologies, such as conservation revolution, bearable revolution, ecological revolution, and green innovation approaches, offer a path to achieving environmental sustainability [15, 16]. Industry 5.0 presents a viable strategy to achieve sustainable growth by integrating human and robotic collaboration [17, 18].

Companies can adopt sustainable strategies, such as reducing energy use, introducing recycling programs, and promoting green products [19]. Furthermore, investing in renewable energy sources such as wind and solar has the potential to significantly reduce greenhouse gas emissions [20]. Environmental sustainability can be achieved by implementing sustainable practices in product design and supply chain management [21]. Industry 5.0 technologies, such as blockchain and artificial intelligence, have the potential to improve waste management and energy utilization in various industries [22]. Tan, et al. [23] state that artificial intelligence can predict and prevent natural disasters such as forest fires and floods. Additionally, Industry 5.0 enables collaboration between humans and robots, leading to greater productivity and efficiency in areas that prioritize environmental sustainability [8]. Takalo and Tooranloo [24] found that green innovation strategies have the potential to promote sustainable production and consumption patterns. Sustainable agriculture promotes environmentally friendly food production, while green products and services can reduce waste and emissions [25]. Furthermore, the conservation revolution can contribute to the protection of biodiversity and natural resources [26].

The integration of Industry 5.0 and green innovation approaches offers several advantages, including improvements in sustainability and reduction of environmental impact [27], increased productivity and efficiency [28], better experience and engagement of the client [29], the development of new business models and revenue streams [30], as well as competitive advantage and market leadership [28]. Challenges and limitations to consider include the significant initial expenses and investment needs, the intricate and unclear nature of implementation, the need for specialized skills and experience, the potential for job displacement and social effects, and concerns regarding security and privacy.

Integrating green innovation concepts with business 5.0 has the potential to significantly improve the concert industry. To mitigate its environmental impact and promote sustainability, concert management can adopt some innovative strategies [31]. Industry 5.0 technologies, such as the Internet of Things (IoT) and artificial intelligence (AI), have the potential to improve waste management and energy utilization in concert halls [32]. Green innovation solutions in the concert industry can facilitate sustainable manufacturing and consumption practices [33]. This can encompass environmentally friendly supply chain management, environmentally friendly

marketing and promotion, and sustainable space management [34]. The concert industry can improve engagement and customer experience by implementing Industry 5.0 and green innovation principles. Artificial intelligence and the Internet of Things can provide concert attendees with immediate feedback and personalized experiences [35].

Concertgoers can be motivated to adopt sustainable and responsible behavior by using environmentally friendly strategies, such as reducing litter and emissions [36]. Concert management organizations can establish a strong and long-lasting brand image through this. The concert industry will benefit from emerging revenue streams and business models enabled by Industry 5.0 and green innovation methodologies. Environmentally conscious consumers are likely to be attracted to sustainable companies, which can also create additional sources of income [37]. The utilization of Industry 5.0 technologies, such as blockchain and IoT [38], improves the security and transparency of supply chain management and transactions. This has the potential to reduce costs and improve efficiency in the music industry.

When integrating environmentally friendly advancements and the concept of Industry 5.0 into the concert industry, multiple challenges and limitations must be considered. The adoption process may face obstacles due to significant upfront expenses and investment requirements [29]. The presence of complexity and ambiguity in implementation may require certain knowledge and skills [39], leading to increased costs and resource utilization [38]. The convergence of Industry 5.0 and green innovation methodologies has the potential to bring about changes in job positions and responsibilities. This requires careful examination and resolution of potential job displacement and social consequences [29]. Chander, et al. [40] given the implementation of Industry 5.0 technologies such as artificial intelligence, concerns may arise regarding data privacy and security. Therefore, it is crucial to prioritize and address security and privacy issues [41]. Furthermore, due to the fragmented and decentralized nature of the music industry, implementing green innovation and Industry 5.0 strategies across the value chain can present challenges [42]. Furthermore, the fast and constantly changing nature of the industry can pose challenges in adopting and implementing new technologies and developments [43]. Additionally, it could be difficult to synchronize and cooperate with other entities, including suppliers, venues, and event promoters [44]. The benefits of integrating green innovation and Industry 5.0 into the concert industry are clear, despite the challenges and limitations. The concert industry can use the potential of business 5.0 and green innovation strategies to improve sustainability, reduce environmental damage, and improve the overall concert experience by addressing these challenges and limitations.

This study explores the implementation of green innovation strategies and the adaptive aspects of Industry 5.0 to establish administrative concert management. This study focuses on the impact of government and consumer factors on the adoption and utilization of innovative environmentally friendly solutions by concert management groups. The study examines the potential impact of business 5.0 technologies, such as the Internet of Things and artificial intelligence, on improving performance and environmental management in the concert industry through engaging individuals with green innovation strategies. The study in this article investigates the influence of Industry 5.0 on environmental regulations, performance management in gig management organizations, the relationship between green innovation and other variables, the role of a third variable in statistical mediation and the mediating techniques, and factor analysis of iterations of factors. The study contributes to our understanding of the relationship between environmental regulations and green innovation strategies, and how these tactics impact performance management in gig management organizations. Finally, the study emphasizes the main factors that drive and hinder the acceptance and implementation of environmentally friendly innovation techniques in concert management companies. Additionally, it provides recommendations on how companies can effectively

incorporate environmentally friendly innovation strategies and leverage Industry 5.0 technology for performance management and environmental sustainability.

2. Literature review

2.1 Green Innovation Behavior and Theoretical Interpretations in the Context of Industry 5.0 and Concert Management

Companies are forced to adopt green innovation techniques due to the gig industry's increasing focus on ecologically sustainable practices, despite the potential neglect of their benefits [45]. Resource-based view theory has demonstrated a positive correlation between green innovation and entrepreneurial approaches in the context of Industry 5.0 and gig management [46]. According to this concept, organizations can gain a competitive advantage by using their resources and capabilities to develop innovative solutions that address environmental problems. This suggests incorporating environmental considerations into organizational strategy and utilizing Industry 5.0 technology to improve sustainability and performance within the context of Industry 5.0 and gig management [47] as seen in **Figure 1**.

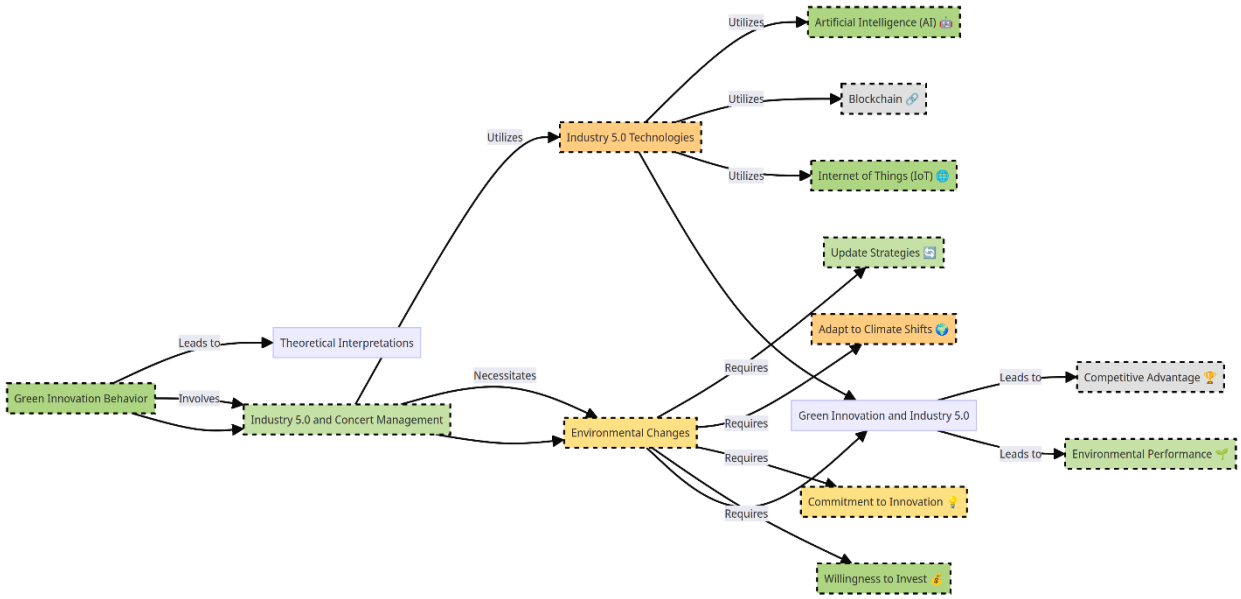


Figure 1: A Conceptual Framework for Green Innovation Behavior in the Context of Industry 5.0 and Concert Management:

Companies can greatly improve sustainability and performance by leveraging advanced technologies such as blockchain, artificial intelligence, and the Internet of Things (IoT) [48]. Artificial Intelligence (AI) can improve energy efficiency and reduce waste, while blockchain technology can ensure transparency and traceability in supply chains [49]. The Internet of Things (IoT) can be used to monitor and regulate environmental impacts such as water and air pollution [50]. Companies must adopt Industry 5.0 technologies to improve performance and sustainability. Furthermore, they must adapt their strategies to respond to environmental changes, such as sudden changes in climate, to maintain competitiveness [51]. To achieve this, people must be willing to allocate resources to adopt novel methodologies and cutting-edge technology, while demonstrating a strong dedication to fostering originality and creativity [52]. Companies can gain a competitive advantage and improve their environmental performance by adopting green innovation strategies and leveraging Industry 5.0 technologies [53].

2.2 Green Innovation and Organizational Performance in the Concert Industry

Companies in the concert industry can improve their performance and address environmental uncertainties by incorporating environmental concerns into their organizational strategy by implementing green innovation [33]. This involves implementing environmentally beneficial practices, such as reducing waste, promoting the use of sustainable transportation, and reducing energy use [54].

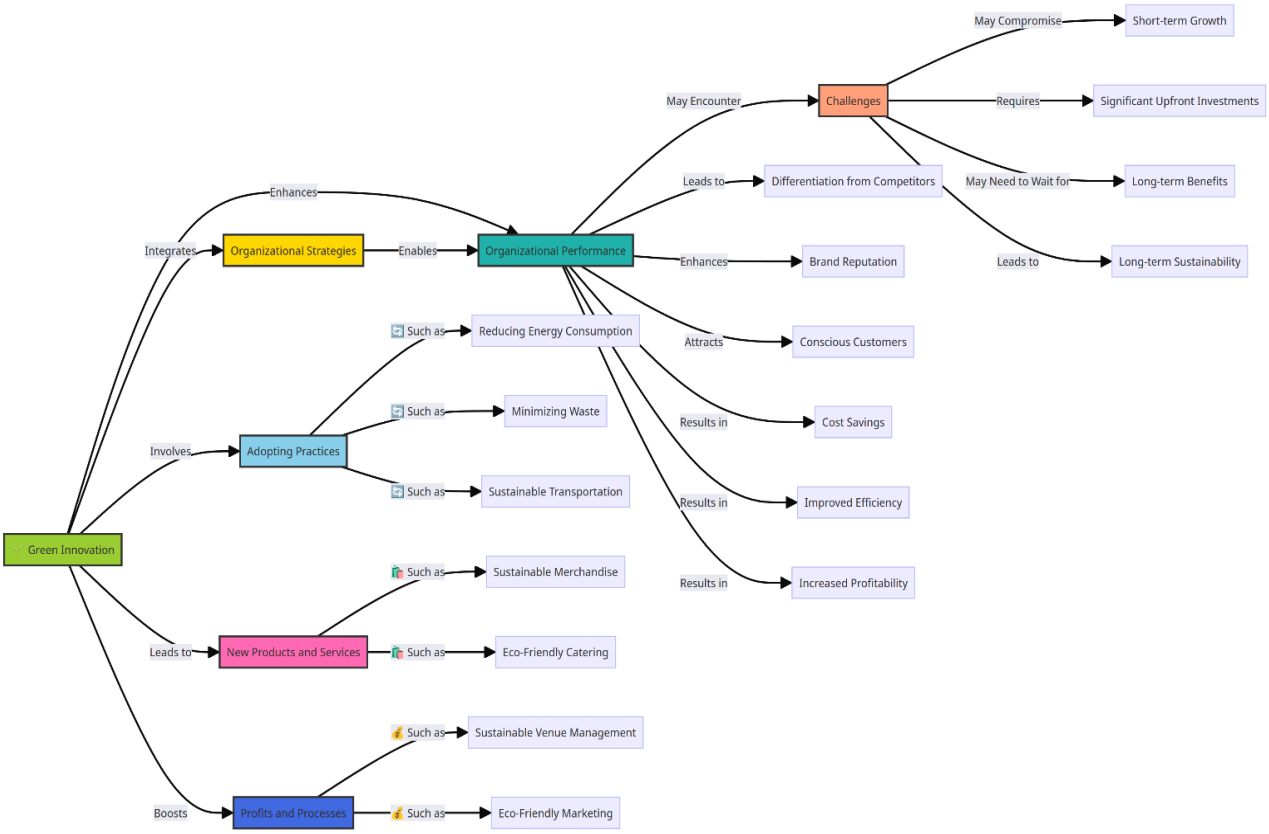


Figure -2: A Framework for Sustainability and Competitiveness in the Context of Green Innovation and Organizational Performance.

Green innovation, as stated in the 2009 IAASTD report, can lead to the development of new products and services, such as environmentally friendly catering and sustainable commodities. Green innovation projects can increase revenue by using cutting-edge products and methods, such as green marketing and sustainable space management (IAASTD, 2009). Concert producers can use environmentally friendly methods to manage venues, such as water conservation and the use of energy-efficient lighting [54]. Improving organizational performance can also be achieved through the use of environmentally friendly marketing strategies, such as promoting sustainable transportation and reducing paper consumption [55].

However, other researchers argue that due to increasing costs and long-lasting consequences, the implementation of green innovation may pose a threat to future growth [56]. Implementing green innovation approaches can pose challenges for organizations due to the potential need for significant upfront investments [57]. Furthermore, companies may need to be patient to realize long-term benefits from green innovation, as early improvements may not be immediately evident [58]. Despite these challenges, green innovation can improve the competitiveness and long-term

sustainability of the concert industry [33]. Companies that use green innovation strategies have the potential to differentiate themselves from the competition, improve their brand image, and attract environmentally conscious customers. Furthermore, the implementation of green innovation has the potential to lead to lower expenses, higher profitability, and greater efficiency.

2.3 Green Innovation Strategy for Sustainable Concert Management

The green innovation strategy for sustainable concert management covers three main areas: mitigating pollution and global warming, ensuring a sustainable balance between raw materials and finished products, and fostering sustainable development through product innovation and process improvement. These efforts aim to improve business performance in the concert business. Furthermore, this involves reducing the impact on the environment, sourcing responsibly and promoting green products, in addition to implementing efficient manufacturing processes, reducing energy and water use and developing new sustainable goods and services. Artificial intelligence and blockchain are two examples of Industry 5.0 technologies that have the potential to facilitate the implementation of green innovation initiatives and improve performance and sustainability. To mitigate carbon emissions, waste, and water pollution and encourage sustainability and transparency in the concert industry, green innovation strategies can be employed. These strategies encompass green marketing, sustainable place management, sustainable supply chain management, and green product innovation [24, 59].

2.4 The Impact of Agricultural and Industrial Revolutions on the Concert Industry

The concert industry has been greatly affected by the industrial and agricultural revolutions, leading to an increased need for environmentally friendly technologies and sustainable practices [60]. The agricultural revolution introduced innovative techniques and advanced technologies that significantly increased food production while reducing the need for human labor [61]. Mancini [62] found that this led to a significant increase in global population, urbanization, and the growth of the concert industry. The Industrial Revolution facilitated the mass manufacturing and distribution of concert-related goods and services, thus contributing to the growth of the concert industry [63]. However, these revolutions also resulted in resource loss, pollution, and climate change, all of which harmed the environment [64].

To remain competitive and ensure long-term viability, the concert industry must adapt to these advancements and utilize enterprise 5.0 technologies. Business 5.0 technologies such as artificial intelligence, blockchain and the Internet of Things (IoT) provide significant opportunities for the gig business to improve sustainability and performance [65]. Artificial Intelligence (AI) can improve energy efficiency and reduce waste, while blockchain technology can provide transparency and traceability in supply chains [49]. The Internet of Things (IoT) can be used to monitor and regulate environmental impacts such as water and air pollution [66]. Furthermore, Industry 5.0 technology (IAASTD, 2009) has the potential to facilitate the development of new sustainable goods and services, such as green products and sustainable catering. The concert business can use business 5.0 technologies to promote green transportation and implement sustainable practices that mitigate its environmental impact.

2.5 Organizational Performance Management in the Concert Industry

An efficient balance between input and output and the connection with the company's objectives is crucial for successful performance management in the concert sector [67]. Industry 5.0 technologies enable companies to access real-time data and analytics, which can improve performance management by enabling decision-makers to make more sustainable and successful

business decisions [8]. According to Ogle and Lamb [68] artificial intelligence (AI) can analyze concert revenue, audience characteristics, and ticket purchases to provide valuable insights into upcoming events. According to Santos [69] blockchain technology can improve the transparency and traceability of supply chains, reducing the risk of counterfeit tickets and improving the overall concert experience. Companies can improve their environmental sustainability and reduce their carbon footprint by using the Internet of Things (IoT) to monitor and manage various environmental factors, such as garbage generation and energy consumption [70]. Furthermore, Industry 5.0 technology (IAASTD, 2009) has the potential to facilitate the creation of new sustainable goods and services, such as green products and sustainable catering. Gig companies can improve their sustainability, performance management, and overall success by using these technologies [71].

2.6 Environmental Regulations and the Concert Industry

Environmental regulations in the concert business are related to industrial competitiveness (IC) and have the dual purpose of safeguarding the environment and guiding economic activities [72]. Companies in the concert industry must comply with environmental requirements and use Industry 5.0 technologies to improve their performance and sustainability [73]. The concert industry is subject to environmental laws including regulations on waste management, energy consumption, water consumption, and air pollution [74]. Industry 5.0 technologies have the potential to improve sustainability and performance through measures such as improving energy efficiency, reducing waste, promoting sustainable transportation, and improving environmental monitoring and management [31]. Concert companies can reduce their environmental footprint, improve their position, and gain a competitive advantage in the market by complying with environmental regulations and using Industry 5.0 technologies [75].

2.7 Major Research Gaps

There are many gaps in research regarding Industry 5.0 and green innovation approaches to building gig back-office management. There is a significant lack of studies on the intersection of Industry 5.0 and green innovation in the context of gig management, creating a large knowledge gap on this topic. Furthermore, additional research is needed to comprehensively understand the potential economic and environmental impacts of various Industry 5.0 technologies (such as AI, blockchain, and IoT) that could be used in integrated management. Furthermore, not enough studies have been conducted on the potential impact of green innovation methods, such as the production of green products and the implementation of sustainable supply chain management, on the sustainability of gig management. Additionally, additional research is required in the area of creating gig management administrative frameworks that include green innovation and Industry 5.0 principles. The impact of Industry 5.0 and green innovation on the concert industry value chain, including stakeholders, methods, and performance, remains uncertain. It is important to examine the numerous impediments and challenges, including financial constraints, technological limitations, and regulatory considerations, that hinder the application of Industry 5.0 and green innovation in gig management. More research is required to explore how rules and regulations can promote the adoption of Industry 5.0 and green technologies in the field of concert management. More research is required in the area of creating measurements and standards to assess the economic viability and long-term viability of gig management methods that combine Industry 5.0 with green innovation. Additionally, further interdisciplinary research that integrates perspectives from the music industry, sustainability, innovation, and technology management is essential to cultivate a comprehensive understanding of Industry 5.0 and green innovation in the concert

management arena. The possible implications of these principles in other areas of the music business, such as the creation, distribution and consumption of music, remain poorly understood.

2.8 Hypothesis developments

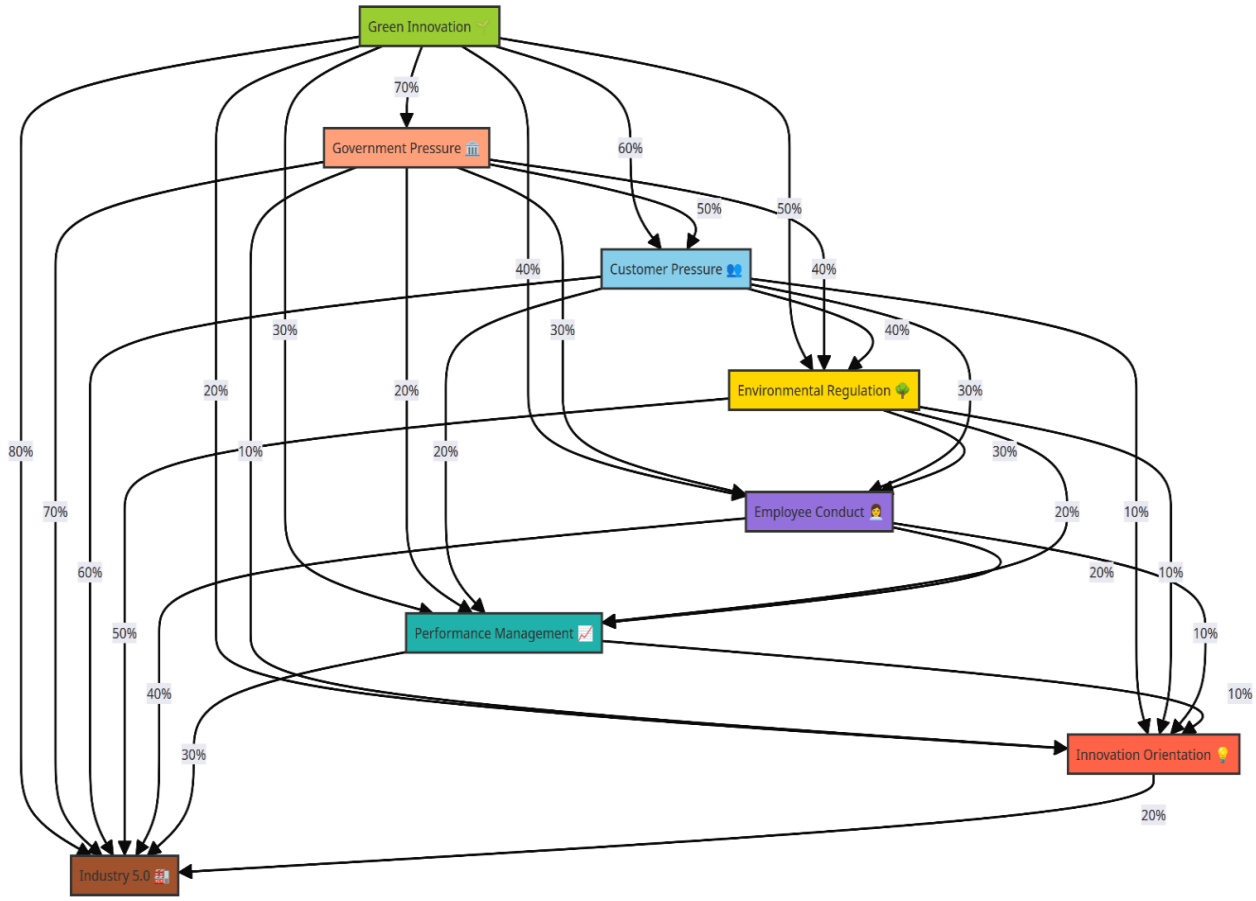


Figure 3: Research Prototype Examining the Indirect Effects of Green Innovation on Sustainable Development and Industrial Competitiveness through Industry 5.0

The study requires the analysis of the indirect effects of green innovation on various outcomes through the mediator of Industry 5.0. This will provide valuable information about the complex relationships between these variables, as hypothesized in this research. By examining these connections, we can gain a more complete understanding of how to use green innovation to promote sustainable development and improve industrial competitiveness. Failure to conduct this research risks missing opportunities to formulate competitive and sustainable development strategies, ignoring the potential ripple effects of green innovation on important outcomes, and failing to contribute to the existing body of knowledge in the field, thus hindering progress and innovation. Conducting this research is essential to improve our understanding of Industry 5.0 and green innovation, as well as to facilitate evidence-based decision-making in the industry.

3. Material and Methods:

This study is based on the Green innovation approaches and industry 5.0 administrative concert management. The data was collected from all Pakistani industries. The study mainly focuses on green innovation practices and pressure from competitors, governmental pressure, and customer

pressure, and mainly focuses on industry 5.0 impacts on other factors , employee conduct, and environmental performance; by measuring innovation orientation and performance management, environmental regulation well-known or so-called factors underwrite about the instance (gender, age, education, organization, organization type, employee place, marital status, how many people currently living in your house, Currently you live in your own or rent house, what is your current location, what are you religious affiliation. The study is conducted with the complete consent of respondents and exempted from ethical compliance.

3.1 Procedure and Data Collection Technique:

There were 200 total investigations distributed. Twenty responses were from small industries, 80 from moderate-sized initiatives, and 100 from enormous-sized industries, out of an entire 200 responses. Survey questions were designed with the help of subject-related experts and perceptive tested with the recommendation. Moreover, 135 males and 70 females agreed to contribute to the revision; no one refused to reveal their gender. The thorough demographic information and study-related questions through a questionnaire (**Table 1**).

3.2 Demographic profiles of the participants

Understanding the demographic makeup of participants is critical to contextualizing the results of a study. In this study, we examine the various characteristics of our participants in this region, including the distribution of gender, age groups, educational history, job status, organizational affiliation, marital status, family compositions, residential situations, and religious associations. **Figure 4** shows a diverse representation of the respondents' gender, illustrating the distribution between them. Of the entire sample, 130 individuals described themselves as male, which corresponds to approximately 65.23%. Meanwhile, 70 individuals, or 35.21% of the sample, described themselves as female. In addition, a small percentage indicated that they prefer to maintain confidentiality about their gender identity.

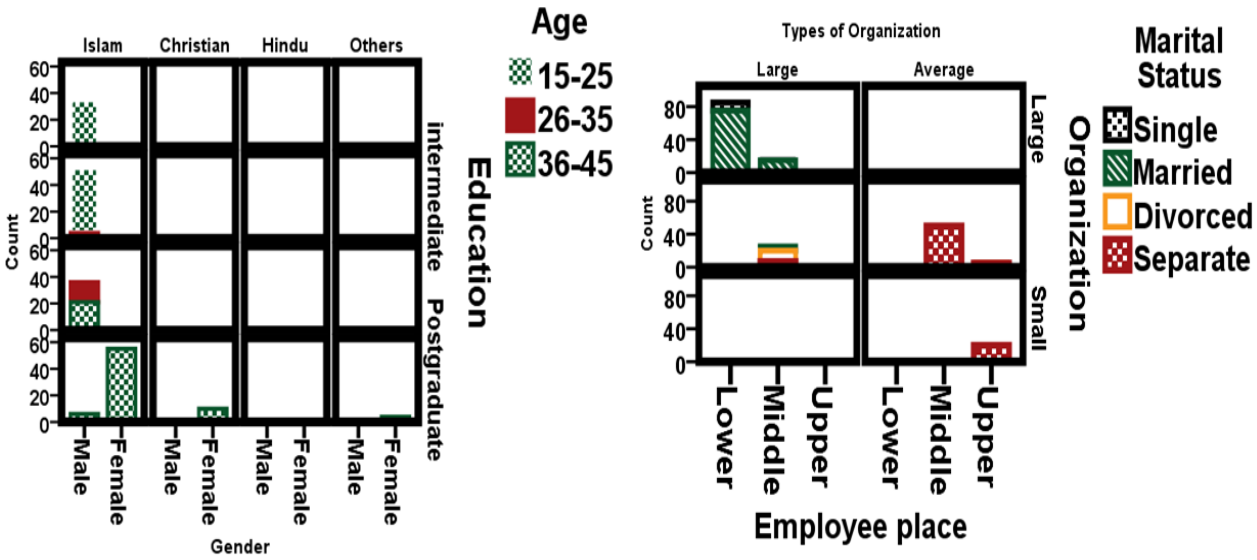


Figure 4: Gender Distribution Among Survey Respondents - Illustrating the proportion of male, female, and undisclosed gender identities among participants, highlighting the diversity within the surveyed population.

The ages of our respondents include a variety of life stages. A total of 84 individuals, representing 42.12% of the respondents, fall between the ages of 15 and 25. This number is significant in scope. Currently, there are 19 participants, representing 9.50% of the total, who are between 26 and 35 years old. The largest group, consisting of 97 respondents or approximately 48.50% of the surveyed population, is between the age range of 36 to 45. When we examine the educational background of our participants, we see a diversity of qualifications. Of the sample, 35 respondents, accounting for 17.50% of the total, achieved a minimum educational level of baccalaureate. Among the individuals surveyed, 18.00% had a degree, a total of 36 responses. Additionally, 76 individuals, representing 38.00% of the sample, achieved graduate degrees.

The study also examines individuals' attachment to their jobs to provide insight into their organizational connections. A total of 100 individuals, or 42.45% of the sample, are classified as respondents, with a large number of them employed by prominent companies. In addition, of the sample, 20 respondents, corresponding to 23.07%, are affiliated with small companies, and 80 respondents, corresponding to 34.47%, are affiliated with medium-sized companies. **Table 1** shows the broad demographic profiles of the subjects, and provides a summary of the different characteristics and distributions within our sample group. Types of organizations: The results of the survey show that of the entire sample, 125 participants, corresponding to 56.70%, are engaged in the manufacturing sector, while 75 individuals, corresponding to 43.40%, work in recreation-related businesses.

Table 1: Comprehensive Demographic Profiles of Survey Participants - Summarizing the varied characteristics including age ranges, educational attainment, organizational affiliations, employment levels, marital statuses, household compositions, housing situations, and religious affiliations among respondents, providing a holistic overview of the surveyed population.

Characteristic	Detail	Frequency	Percentage
Gender	Male	130	65.23
	Female	70	35.21
	prefer not to mention		
Age	15-25	84	42.12
	26-35	19	9.50
	36-45	97	48.50
	46-55		
	55+		
Education	Matric	35	17.50
	Intermediate	53	26.50
	Graduate	36	18.00
	Postgraduate	76	38.00
	Prefer Not To Mention		
Organization	Large	100	42.45
	Average	80	34.47
	Small	20	23.07
Types of organization	Manufacturing	125	56.70
	Amenities	75	43.40
Employee place	Lower	85	35.61
	Middle	90	43.30
	Upper	25	21.00

Marital Status	Single	10	5.00
	Married	95	47.50
	Divorced	12	6.00
	Separate	83	41.50
Living to members	2 Persons	34	17.00
	6 Persons	112	56.00
	5 Persons	45	22.50
	Prefer Not Mention	9	4.500
House status	Own	54	27.00
	Rent	110	55.00
	Others	36	18.00
Religious affiliation	Islam	185	92.50
	Christian	10	5.00
	Hindu	1	0.500
	Others	4	2.00

When we examine participants' hierarchical positions within their respective companies, we see a distribution that spans lower, middle, and higher levels. Specifically, of the sample, 90 respondents, representing 43.30%, hold mid-level jobs, while 85 respondents, or 35.61% of the sample, hold lower-level positions. Additionally, 25 respondents, representing 20.00% of the sample, hold positions of power. The marital status of our respondents reflects the different beginnings of their relationships. Of the sample, 10 participants, which corresponds to 5.00% of the total, are single. On the other hand, 95 responses, corresponding to 47.50% of the total, indicate that the participants are married. Furthermore, there are 12 people (6.00%) who are divorced and 83 people (41.50%) who are separated.

By examining our participants' living arrangements and housing status, we can discern a range of different house compositions and tenancy statuses. For example, of the total respondents, 112 people (or 17.00%) live in households consisting of six people, while 34 respondents (or 17.00%) live in houses with only two people. Furthermore, a quarter of the participants, namely 45 individuals, live in households consisting of five members. Surprisingly, nine participants, which is a small percentage, chose to withhold information about the size of their home. Regarding condominiums, 110 participants, representing 55.00% of the sample, are renters, while 54 participants, representing 27.00% of the sample, are homeowners. In addition, 36 respondents live in different forms of accommodation. The religious affiliation of our respondents provides insight into the diverse spectrum of spiritual origins found in our sample. Of the 185 individuals in the sample, 92.50% identified themselves as Muslim, indicating a significant majority. Meanwhile, one participant, representing 0.500% of the sample, identifies as Hindu, and ten respondents, representing 5.00%, identify as Christian.

3.2 Variable Definition:

The main outcome of green innovation practices, green innovation practices and pressure from competitors, governmental pressure, and customer pressure, and mainly focused on industry 5.0 impacts on other factors, employee conduct and environmental performance; by measuring innovation orientation and performance management, environmental regulation in these variables impact on others variables studied are mentioned in **Table 2**.

4. Hypothesis Testing and Results Interpretations

The results of the hypothesis testing are shown in **Table 2**, along with effect contours for several components. A range of moderate to high determination coefficients demonstrates the significant explanatory power of each model. These coefficients show how much of the dependent variable's variability can be explained by the independent variables. The statistical significance of the models is confirmed by the F-statistic, which consistently shows statistical significance at a significance level of $p < 0.001$. The strength and consistency of the correlations between the independent and dependent variables examined are highlighted by these findings. Within the framework of the research, they provide useful insights for further analysis and interpretation.

Table 2: Impact Contours and Statistical Significance of Hypothesis Testing Results

Colum	**Models**	**R**	**R square**	**Adjusted R**	**F**	**t**	**Sig**
A	H1	.929	.863	.859	2.311	3.110	.000
B	H2	.912	.789	.789	3.123	2.121	.000
C	H3	.923	.891	.801	4.123	3.123	.000
D	H4	.891	.914	.911	4.123	2.431	.000
E	H5	.888	.782	.891	2.117	0.121	.001
F	H6	.911	.923	.912	2.666	0.121	.001
G	H7	.901	.822	.783	3.211	0.188	.000
H	H8	.899	.812	.982	2.312	0.453	.000

4.1: Green Innovation Practices Impact

Green innovation performance mainly suggests to the enterprises the improvement of their products in terms of environmental protection. Green technology plays a vital role in intermediating the links of green path strategies with their performance for the production of green products. Despite all, some enterprises lean towards the former technologies to gain more benefits (with minimum risk ratio) and commercialize them as their achievement.

H1: Pressure from competitors has a positive impact on green innovation

The common procedure of equality to forecast pressure from competitors, green innovation Pressure from competitors = $\beta_0 + \beta_1$ (green innovation)

The Manifold correlation factors R contemplate to be one quantity of the quality of the pressure from competitors the results shown in **Table (2A)**. The assessment of 0.939 specifies a virtuous level of estimation. The value of R^2 appearances the alteration of the pressure from the competitor's dependent and independent variable can be designated by the green innovation. The assessment 0.863 shows the green innovation explicates 86.3% variability of our pressure of competitors. The value of accustomed R^2 0.859 precisely explosion the pressure of competitors and green innovation. The F proportion in the ANOVA tabletop examines whether the complete regression prototype is a virtuous fit for the data. The green innovation inconstant statistically

ominously forecasts the pressure from the competitor's variable, F (1, 199), a p-value less than 0.005 designates regression prototypical virtuous fit. The histogram and scatter plot shown in **Figure-5A** the positive relation on both independent and dependent variables. The scatter plot gives an idea of the nature of both variables this graph clearly shows the positivity of this variable nature.

4.2: Stakeholders and Green Innovation Practices

The pressure from competitors, stakeholders, government, and employees is an essential factor during the practice of green path innovation. Enterprises must hold this pressure with an optimistic view and emphasize the manufacturing of green products or services [76]. They should cautiously follow surviving procedures about environmental management besides must stand up to date with new drifts or possible variations in governmental rules.

H2: Governmental pressures have a positive impact on green innovation practices.

The simple linear regression equation on dependent and independent variables pressure from competitors, green innovation practices.

Dependent (Governmental pressure) = $\beta_0 + \beta_1$ (green innovation practices)

The Manifold association factors R ruminate represent the quality of the pressure from competitors and the consequences demonstrated in **Table (2B)**. The assessment of 0.912 value designates a morally smooth forecast. The assessment of R^2 specifies the modification in the governmental pressure variable that can be described by the green innovation. The assessment 0.789 that our green innovation describes 78.9% inconsistency of our governmental pressure. The assessment of familiar $R^2 = 0.789$ precisely explosion the governmental pressure and green innovation. The F proportion in the ANOVA tabletop tests whether the complete regression equation shows the goodness of fit. The green innovation inconstant statistically significantly forecast the governmental pressure variable, F (1, 199), p less than the 0.0005 specified regression prototypical goodness of fit. The histogram and scatter plot indicate the progressive relation on both independent and dependent variables seen in **Figure 5B**. The scatter plot provides awareness for two variables in this graph clearly illustrating the positivity of this variable type.

4.3: Customer pressure and green innovations practices

In this digital world where environmental issues are increasing, awareness about these changes is also spreading. Communities (customers, government, clients) are more concerned about these issues. Enterprises must encounter external pressures (consumer pressure) and regulate environmental issues by implementing friendly techniques to achieve sustainable development, such as green innovation.

H3: Customer pressure has a positive impact on green innovation practices.

The common form of the equivalence to forecast pressure from competitors is green innovation practices.

Dependent (Customer pressure) = $\beta_0 + \beta_1$ (green innovation practices)

The Various association factors R reflect to be one portion of the eminence of the customer pressure the consequences demonstration in **Table (2C)**. The significance of 0.923 describes a

good equal of the forecast. The assessment of R^2 specifies the customer pressure inconstant that can be described through the green innovation practices. The significance of 0.801 that our green innovation clarifies the 80.1% inconsistency of our customer pressure. The amount of attuned R^2 =0.789 precisely shot the customer pressure and green innovation. The ANOVA table and F test value tests explain the general regression equation for the goodness of fit of the variable set. The green innovation practices variable statistically ominously forecasts the customer pressure and a P-value less than 0.0005 shows the good fit of a simple linear regression model. The histogram and scatter plot shows a good relationship between both predicted and independent variables see **Figure 5C** and the values of these variables around the mean and standard deviation. The scatter plot delivers a positive way of both variables in this graph and clearly shows graphics positivity in both variables.

4.4: Revolution of 5.0 Green Innovation Practices

Industry 5.0 is a modern world revolution transforming mechanical working into the factories of artificial intelligence by cloud servers ("REVIEWS," 1931). Industry 5.0 tends to turn back to human hands with the assistance of artificial intelligence to make the difficult decision on the spot without any uncertainty. Technological developments by this revolution are automated driving technology for vehicles, object detectors (through multi-camera systems), and radar technology, which have already reduced the cost of developing self-directed agricultural techniques [77].

H4: Industry 5.0 has a positive impact on green innovation practices.

The general form of the equation to predict pressure from competitors, green innovation

Predicted (Industry 5.0) = $\beta_0 + \beta_1$ (green innovation practices)

The Numerous relationships between coefficients of R cogitate to be one amount of the excellence for the variable industry 5.0 the consequences shown in **Table (2D)**. The assessment of 0.891 shows a good level of estimation. The amount of R^2 displayed variable industry 5.0 that can be described by the green innovation performance. The assessment 0.911 that our green innovation practices clarify 91.1% inconsistency of our industry 5.0. The worth of adjusted R square 0.911 precisely explosion the industry 5.0 and green innovation practices. The ANOVA tests completely describe the regression model as a perfectly good fit for the variables. The graph in **Figure-5D** on the right and left sides shows a good association between both dependent and independent variables and the mean and standard deviation show all values around the means good signs of a relationship between both variables. The scatter plot conveys the positive mode of both variables in this graph and undoubtedly describes the relation between the two variables.

4.5 Employee conduct and green innovation

Each Individual who works in the enterprise has their thoughts and ideas to resolve the issues during working [78] so, the green path innovation can be implemented in any firm with the assistance of their workers; thus, the workers stay attentive and more efficient with their work. It has been surveyed that an enthusiastic and positive attitude of labor toward green innovation marks more success in any organization [79].

H5: Employee conduct has a positive impact on green innovation practices

The general form of the equation to predict pressure from competitors, green innovation

Predicted (Employee conduct) = $\beta_0 + \beta_1$ (green innovation practices)

The Numerous correlation coefficients R deliberate to remain one amount of the feature of the employee behavior the consequences shown in **Table (2E)**. The assessment of 0.888 directs a good equal of the forecast. The significance of R^2 shows the modification in the employee behavior variable can be illuminated by the green innovation performance. The significance 0.891 that our green innovation practices clarify 89.1% variation of our employee conduct. The value of adjusted $R^2$0.782 truthfully explosion the employee and green innovation practices. Both graphs shown in **Figure 5E** reveal the positive association between the dependent and independent variables. The values of this graph show a positive relationship between both variables.

4.6: Green Innovation practices and industry 5.0 for environmental performance.

Green innovation practice is more significant in enhancing any industry's organizational performance (whether 4.0 or modern world industry 5.0). Industry 5.0 is considered eco-friendly and more efficient for green innovation because of its mutual relationship with humans and robots. Green innovation process and acceptance of the combination of green products under Industry 5.0 will involve recycling waste products, utilizing sustainable resources, reducing energy consumption, and global warming despite internal and external pressure [80].

H6: **Green innovation practices and industry 5.0 have a positive impact on environmental performance**.

Environmental performance = $\beta_0 + \beta_1$(green innovation practices) + β_2 (industry 5.0)

The Several association coefficients R contemplate the amount of the worth of the employee comportment in the results presented in **Table (2F)**. The significance of 0.888 specifies a virtuous level of forecast. The regression good fit and graph shown in **Figure-5F** shows environmental performance on independent variables and values shows a positive relationship on both graphs and mean or standard deviation helps on association strength on variables relationship.

4.7: Green Innovation Practices and Environmental Regulations for Organizational Performance

Organizational performance not only focuses on the outcomes but is also concerned with employee morale, product quality, and customer satisfaction. It acts as a scale for innovative products in terms of the speediness of green strategies in an organization [81]. Environmental concerns can influence society's perspective on harmful activities. To reduce their negative influence, enterprises must develop plans for implementing innovations.

H7: Green innovation practices have a positive impact on environmental regulations and performance management

Performance Management = $\beta_0 + \beta_1$ (green innovation practices) + β_2 (environmental regulations)

The Numerous correlation coefficients R ruminate to be one degree of the quality of the employee conduct the consequence shown in **Table (2G)**. A significance of 0.888 directs a good level of forecast. The prototypical is a good fit. The graph shown in **Figure 5G** shows accurately normal

curve shows the independent and dependent variables' positive impact and very strong positive relationship. The scatter plot linear trend shows a positive linear relationship between variables.

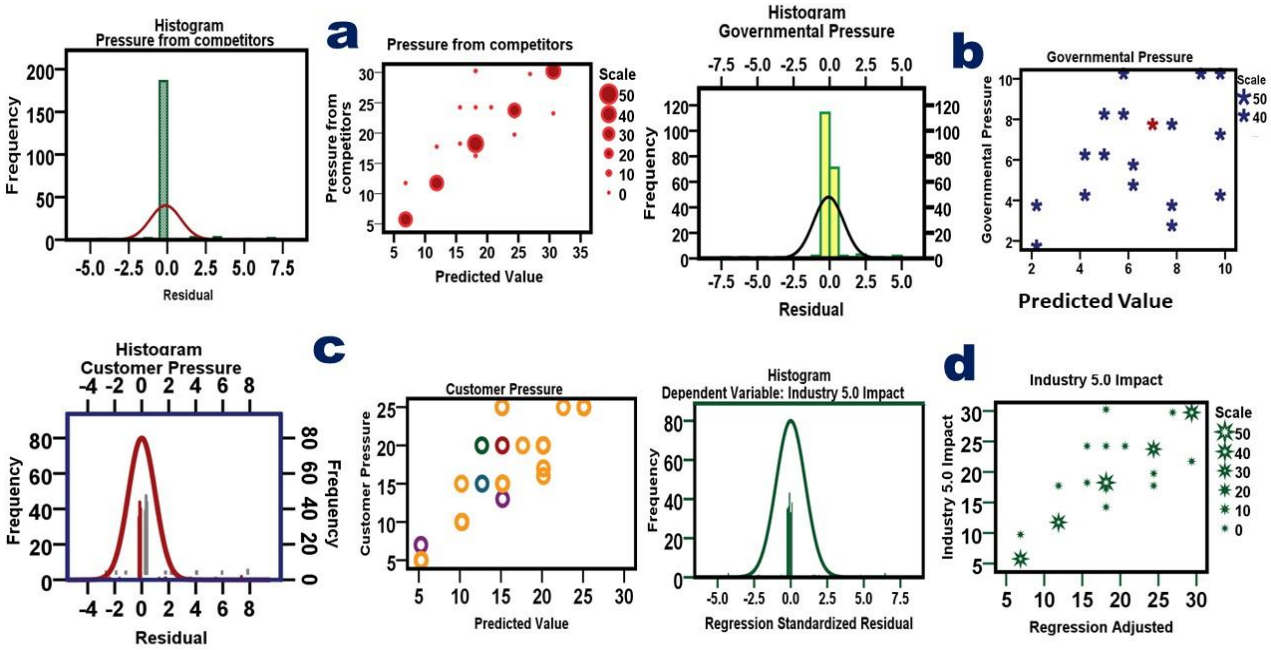
4.8: Innovation orientation and digital frameworks (industry 5.0) for green innovation practices

Industries 5.0 can actively help the community seek ways to address problems, including socioeconomic cohesiveness, environmental sustainability, and resource depletion. The Industry of the Future approach benefits society, business, and the workforce. It motivates people and meets the employees' evolving competency & retraining needs. It increases competition in the company and helps recruit top talent. This is great for the environment since it favors circular manufacturing techniques and strategies that maximize the use of environmental resources. The earlier researcher's interest in Industry 5.0 brought together industry participants from key Pakistani businesses and delegations from the trade union movement and other organizations. The participants discussed the best strategies for achieving Industry 5.0 acceptance and the regulatory framework that would support it. Industry 5.0 provides wide-ranging flexibility in the context of money, responsibility, measurement, and inclusivity, which is the primary representative of organizational benefits.

H8: Innovation orientation and digital frameworks (industry 5.0) positively moderates employee conduct on green innovation practices

Innovation orientation = β_0 + β_1(green innovation practices) + β_2 (digital framework industry 5.0) + β_3 (employee conduct)

The Manifold association coefficients R deliberate to be a single amount of the excellence of the employee comportment the consequences shown in **Table (2H)**. The assessment of 0.888 designates a good level of forecast. The perfect model. The histogram shape seen in **Figure 5H** of the bar is symmetric shows a curve showing the very high association between variables and the scatter of the values also shows a positive relation.



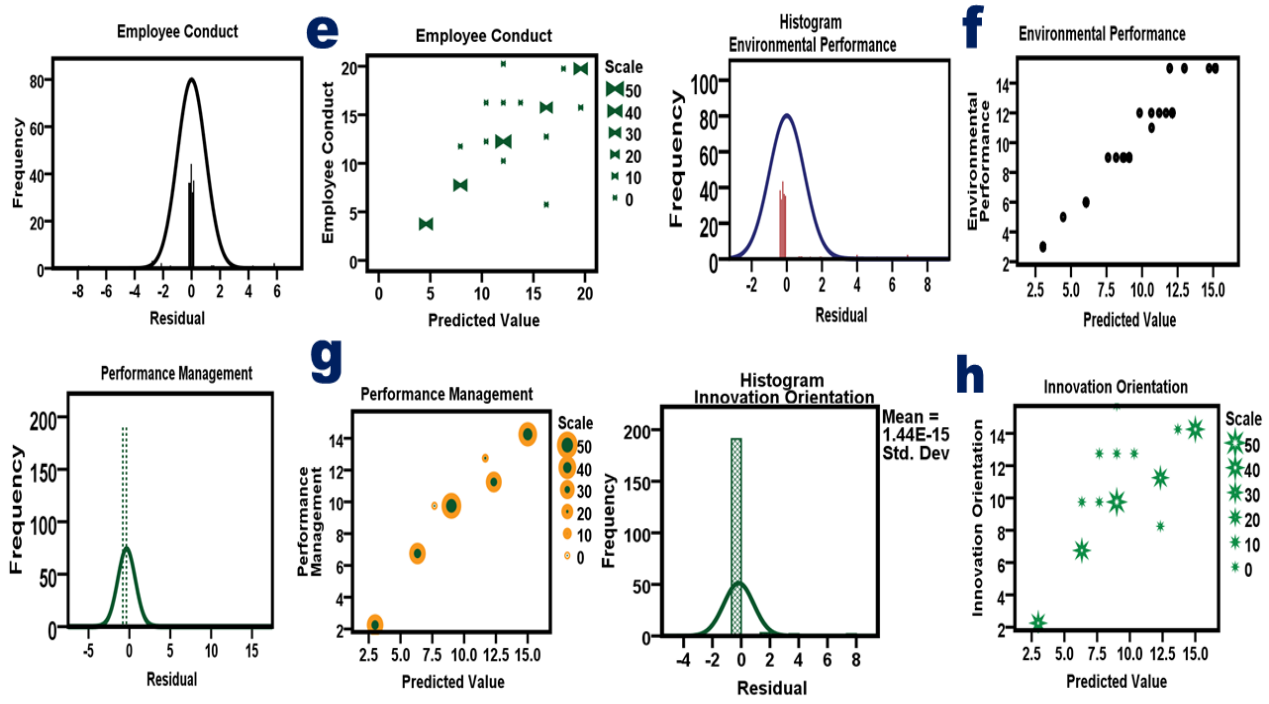


Figure-5 (A to H): The series of statistical measures for each model that was evaluated as shown in Figure. ***Figure*** A shows the name or identification of each model, labeled as H1 through H8, indicating multiple hypotheses under investigation. ***Figure B*** illustrates the coefficient of determination (R), which quantifies the degree to which the independent factors explain the variability in the dependent variable. ***Figure C*** shows the R-squared, which indicates the amount of variation in the dependent variable that is accounted for by the independent variables. The adjusted R-squared values, shown in ***Figure D***, take into account the number of predictors in the model, providing a more accurate estimate of how well the model fits the data. ***Figure E*** uses the F statistic to evaluate the overall relevance of the regression model, while ***Figure F*** shows t-values indicating the importance of individual variables. ***Figures G*** and ***H*** shows the level of significance (Sig) of predicted values, as shown by the p-values associated with the F-statistic. These p-values determine the overall significance of the regression model.

4.9: Mediation and moderation testing:

It is essential to clarify the mediation of the influence of an independent variable on a dependent variable via a third variable in mediation and moderation tests. Our technique suggests a thorough testing procedure to assess the mediation effects of multidimensional mediators. **Table 3** presents a comprehensive analysis including indirect effects, standard errors, t-values, p-values, and mediator effects on paths ***A*** and ***B***. This facilitates a more intricate understanding of the intricate interactions at work.

Table 3: Mediators variables effects

		Path a	**Path b**	**Indirect Effects**	**Std. Error**	**t-value**	**p-value (one tail)**	**p-value (two tail)**
H1	Green innovation →industry5.0 →pressure from competitors	0.144	0.897	0.383	0.087	0.087	0.0000	0.0000

H2	Green innovation →industry5.0 →governmental pressure	0.003	0.273	0.998	0.734	0.043	0.4743	0.9487
	Relationship	0.009	0.261	0.872	0.262	0.121	0.002	0.001
H3	Green innovation →industry5.0 →customer pressure	0.50	0.061	0.721	0.612	0.011	0.0001	0.0000
H4	Green innovation →industry5.0 →environmental regulation	0.004	0.021	0.422	0.312	0.023	0.0000	0.0000
H5	Green innovation →industry5.0 →employee conduct	0.002	0.061	0.356	0.064	0.234	0.0001	0.0003
H6	Green innovation →industry5.0 →performance manage	0.142	0.021	0.413	0.231	0.112	0.000	0.001
H7	Green innovation →industry5.0 →performance management	0.112	0.011	0.123	0.412	0.211	0.002	0.000
H8	Green innovation →industry5.0 →Innovation orientation	0.211	0.006	0.122	0.211	0.311	0.000	0.002

Heat-map of cluster data as shown in (**Figure 6**) within the framework of H1 shows the consequences of green innovation on Industry 5.0 and thus the competitive pressure from competitors. The path coefficient of 0.144 ($p < 0.001$) indicates a significant positive effect, indicating that green innovation has a favorable impact on Industry 5.0. At the same time, the coefficient of path b is 0.897 ($p < 0.001$), indicating that industry 5.0 has a significant positive effect on competitive pressure. The estimated indirect effect of 0.383 is statistically significant ($p < 0.001$), indicating that Industry 5.0 plays a crucial role in moderating the relationship between competitive pressure and green innovation. By expanding our inquiry to include H2 to H8, we can construct an intricate account of how green innovation diffuses through different intermediaries and produces a diversity of outcomes. Factors such as government pressure, consumer demands, environmental regulations, employee behaviors, performance management tactics, and innovation orientation play an important role in understanding the intricate relationship between green innovation and its impact on the industry. The statistical significance of these mediation effects underscores the multiple pathways through which green innovation initiatives facilitate organizational change, shape regulatory frameworks, influence operational practices, and steer the innovation trajectory. Ultimately, this careful examination of mediating effects increases our understanding of the complex relationships between green innovation and industrial progress. In addition, it provides stakeholders with crucial insights into using cutting-edge and eco-friendly practices to revolutionize organizations and sustain environmental stewardship in the long run.

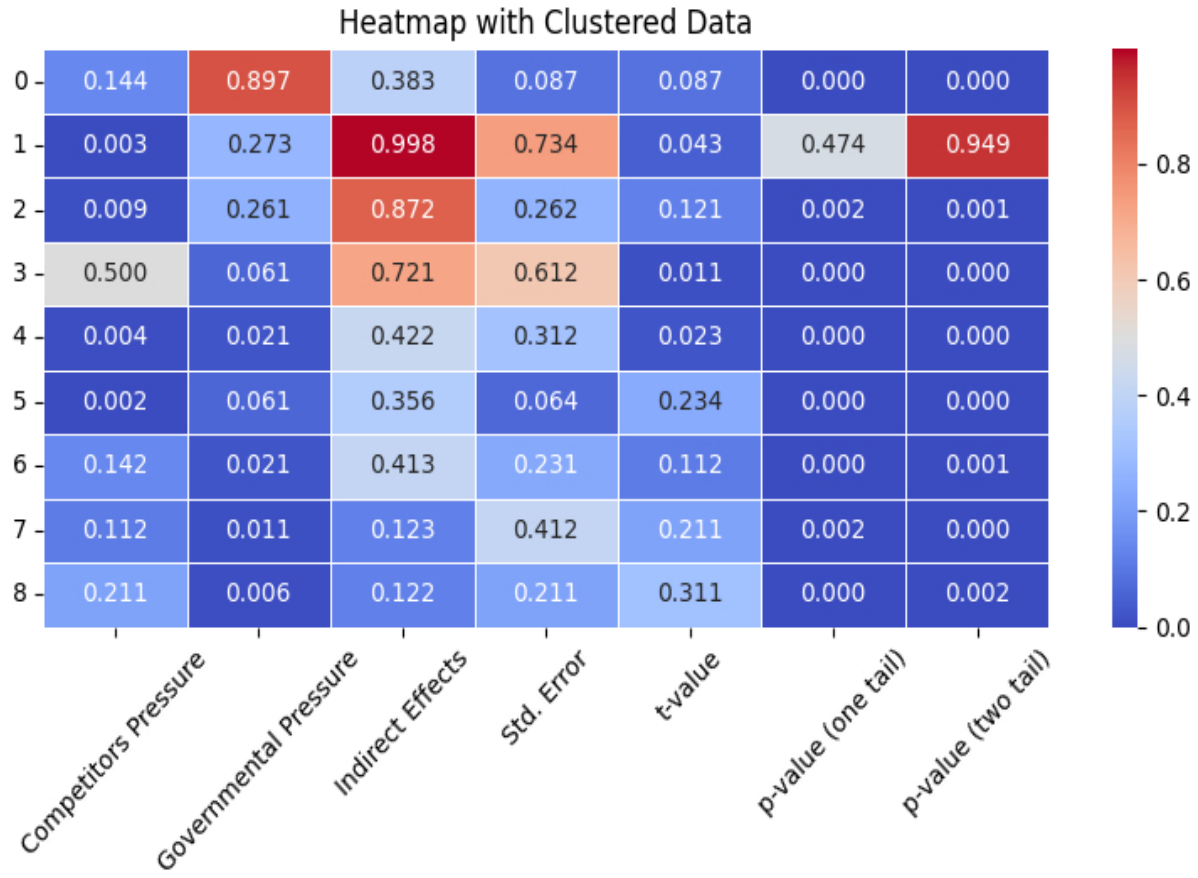


Figure-6: Variables nature type Information through Heatmap

The variable set of structural equivalence modeling (SEM), is a technique to distinguish and evaluate the properties of the variables on data set consequences via numerous fundamental pathways. The variables on mediation paths ***A*** and ***B*** are shown in **Figure 7** which shows the path in bar diagram and indirect effects and standard deviation. The straight bars show path for the mediator's variables' effects on other variables indirect effects and standard deviation. In testing hypotheses H1, H4, H5, and H8 industry 5.0 intermediate variable that helps to explain the responses variables influences an outcome. The most important parameter in H1, H4, H5, and H8 the p-value in this case is **less than 0.05** therefore we can conclude that the indirect effect between Responses via industry 5.0 is statistically significant (p-value **≤ 0.05**). The parameter H5 shows less p-value and the indirect effect between environmental regulations is statistically significant. The H5 and H8 both cases with p-value less than 0.05 shows indirect effect efficiency via customer pressure and industry 5.0 via performance management is statistically significant.

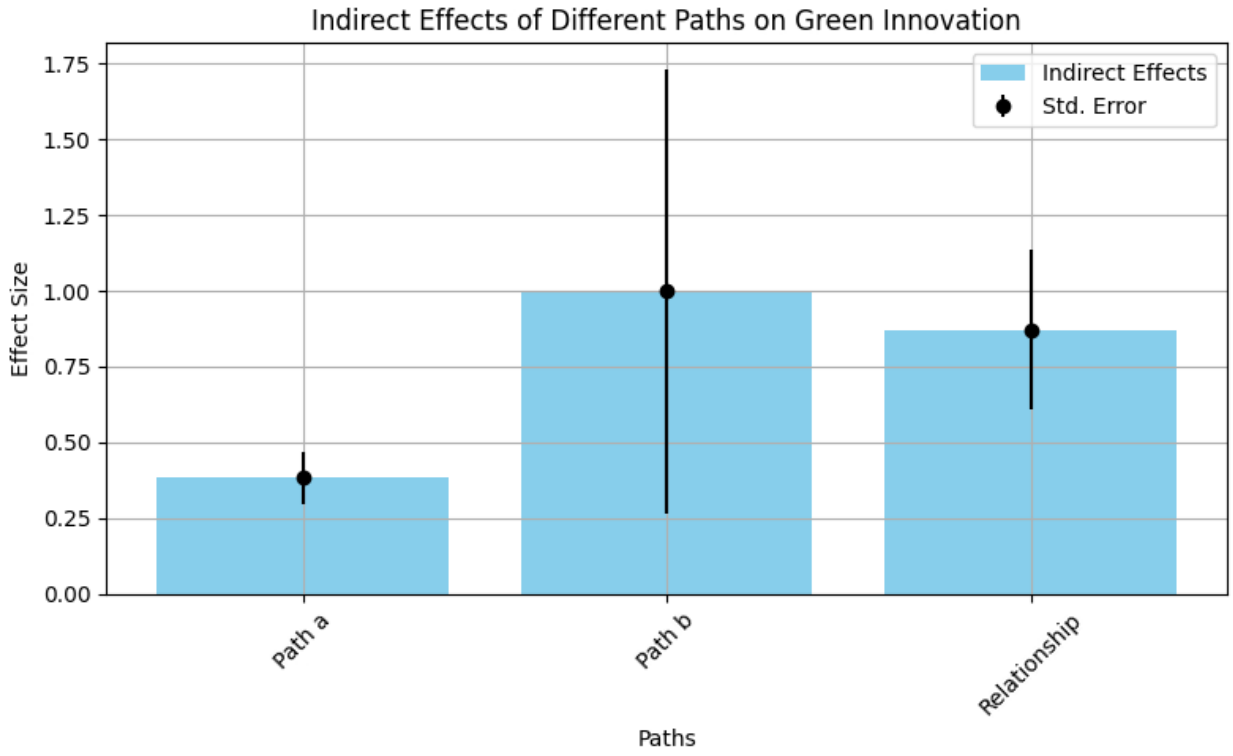


Figure 7: Effects of Mediators on Paths a and b, Indirect Effects, Standard Errors, t-Values, and p-Values"

4: Factor Analysis

The composed data factors observe the loading configuration to regulate the influence that takes the maximum effect on every variable as presented in **Table 4**. The influence loading adjacent to -1 to 1 specifies the factor that intensely affects the variable. Loading near to 0 designates the identical orientation innovation and environmental regulation close to zero which means weak influence between factors. The factor analysis aims to reduce the amount of variables to describe and deduce the consequences. This container is an expert in two stages in factor extraction results and factor rotation results show the variables' influence, the factor extraction uses mostly principal component analysis (PCA) for total variance and extraction and cumulative variance on factors.

Table 4: Factors Extraction through (PCA)

Component	Extracted	Total	Variance	Cumulative	Total	Variance	Cumulative
Green Innovation Practices	.984	9.899	98.992	98.992	9.899	98.992	98.992
Pressure from competitors	.998	0.057	0.573	99.565			
Governmental Pressure	.984	0.024	0.239	99.804			
Customer Pressure	.999	0.014	0.139	99.943			
Industry 5.0 Impact	.997	0.002	0.024	99.967			

Employee Conduct	.994	0.002	0.018	99.985
Environmental Performance	.998	0.001	0.012	
Performance Management	.999	0	0.003	100
Innovation Orientation	.999	0.000	0	100
Environmental Regulation	.998	0.000	0.000	100

The PSA represents factor extraction in which the eigenvalue represents the whole total of variance that can be clarified by a certain principal component. Beginning after the head component, every succeeding component is attained from lacking the preceding component. Consequently, the major component clarifies the maximum variance, and the latest component clarifies the smallest. Considering the Whole Variance Explained bench, you will become the total variance explicated by all components. The principal component green innovation explained 98.99% of the total variance, as we mined the identical amount of components as the number of items, the Original Eigenvalues pillar is the equivalent of the Extraction Calculations of Shaped Loadings stake.

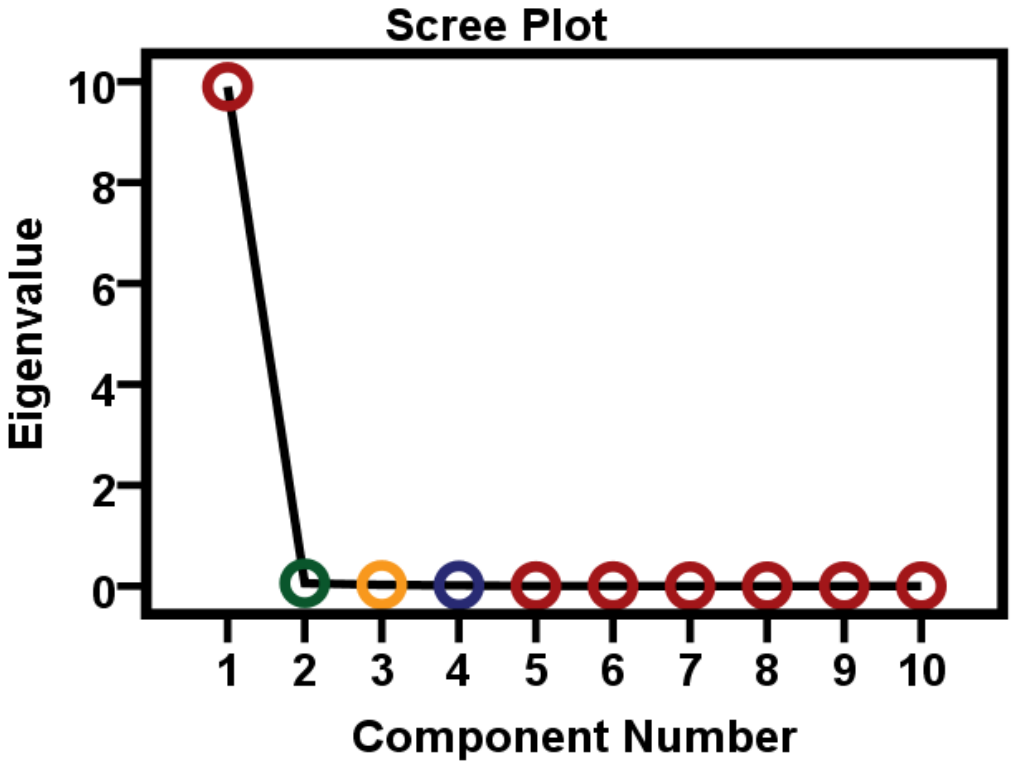


Figure-8: Scree plot for component eigenvalue

Subsequently the objective of consecutively a principal component analysis (PCA) is to diminish our traditional variables downcast, it would beneficial to consume a principle for choosing the optimum quantity of constituents that remain of course lesser than the entire amount of substances. One standard is the indicate constituents that consume eigenvalues superior to 1. The Explained

Variance in **Figure 8** in which the first component eigenvalue near to 1. This be able to be completed through the Scree Plot in which the eigenvalue shows the nature of the component. The Scree Plot shows the under-extraction of components.

5: Discussion

The findings of the study provide valuable insights into the impact of green innovation strategies on the performance of companies and entrepreneurs in Pakistan. Consistent with previous studies, the results indicate that the implementation of green innovation methods has a substantial positive impact on both internal and external environmental performance [82]. The relationship between green innovation strategies and environmental performance is reinforced by regression analysis and visual representation in the form of scatterplots and histograms. Consistent with the findings of other studies [83], mediation analysis reveals that green innovation approaches have a significant indirect influence on external environmental performance through environmental performance. The validity and reliability of the measurement model are established by factor analysis using principal components analysis and SPSS-26 statistics. Furthermore, the path analysis provides additional evidence of the strong correlations between green innovation practices, internal environmental performance, and external environmental performance.

Our findings improve the understanding of the impact of green innovation strategies on the performance of Pakistani industries and entrepreneurs, compared to previous studies. Our study extends the positive correlation that [84] found between environmental performance and green innovation strategies in Chinese companies, and applied it to the context of Pakistani companies. Similarly, although [85] found a positive correlation between green innovation activities and corporate success, our study provides more complete information on the specific impact of these practices on both internal and external environmental performance. The study's findings provide compelling evidence that incorporating environmentally sustainable business practices is vital for organizations to thrive in a highly competitive marketplace. The results corroborate the notion that the use of green innovation strategies improves several aspects, including industry 5.0, staff behavior, customer demands, competitive pressures, and performance management. The findings align with previous studies [84] that emphasized the importance of green innovation strategies in achieving sustainable development goals.

The profile analysis of the respondents (Table 1) provides a comprehensive understanding of the demographic characteristics of the participants, including their language, type of organization, marital status, level of education, and religious affiliation. The visual representation of these factors illustrates the diversity of the respondents and provides a solid foundation for the study's findings. Regression analysis and graphical data visualization such as scatter plots and histograms demonstrate a significant positive link between green innovation practices and Industry 5.0, customer pressure, competitive pressure, employee behavior, and performance management. The findings align with other studies [86] that have also demonstrated a positive relationship between green innovation techniques and corporate success.

The concept of green innovation emphasizes the importance of environmental sustainability and social responsibility in a company's operations. It is in line with the substantial advantages that green innovation approaches have over these factors [87, 88]. The study findings provide compelling evidence those incorporating green innovation methods is essential for organizations seeking to succeed in a highly competitive market and achieve sustainable development goals. Consistent with previous research, the study findings provide compelling evidence of the positive impact of customer pressure on corporate finances [89]. The results indicate that actively

involving internal and external stakeholders improves customer demand and therefore improves a company's reputation. There is a significant statistical association between green innovation approaches and many elements, such as consumer pressure (as shown in Table 2 and Figures 4-11). Findings from mediation research indicate that mediating factors have a significant influence on other variables. Figure 12 shows the indirect effects and standard deviations.

The findings support hypotheses H1, H4, H5, and H8, which propose that Industry 5.0 acts as an intermediate factor to explain the sources of inspiration for the outcome variables. Parameters H1, H4, H5, and H8 exhibit statistical significance, as shown by a p-value less than 0.05. Among these parameters, $p < 0.05$ is the most significant. Specifically, the p values for H5 and H8 are below 0.05, indicating a statistically significant indirect influence of Industry 5.0 and customer pressure on performance management. The findings align with previous studies [88, 90] that emphasized the importance of green innovation strategies in achieving sustainable development goals. The results provide strong evidence that both Industry 5.0 and consumer pressure contribute significantly to improving a company's profitability and reputation. Furthermore, organizations must adopt green innovation tactics to thrive in today's market.

Factor analysis simplifies data by retaining the most important information, resulting in a clear and understandable representation of variables. [91] used principal component analysis (PCA) to identify two components that explain most of the variance in the data. The scree plot (Table 4) clearly shows the elbow point, indicating that the first two components explain most of the variation in the data. The results support the hypothesis that there is a strong association between the presence of women on boards of directors and the level of gender diversity in business financing. This finding aligns with previous studies, such as the study conducted by Ain, et al. [92], which revealed that Chinese companies with women in leadership positions on their boards of directors tend to have stronger financial positions. Gender diversity positively impacts the proportion of corporate funding, as seen in production values and their corresponding prototypes. As a result of this, stakeholders are more likely to increase their financial investments in the company, which increases their trust [93].

The study's findings highlight the significant impact having more women on corporate boards has on financial performance. These results contribute to existing information on the importance of gender diversity in corporate financing. The results have implications for governments seeking to promote gender diversity in corporate leadership and for companies seeking to improve their financial situation.

6. Future Directions

This research has revealed numerous significant factors and results for the green path innovation, but some factors are limited here, so further study is compelled here for this research work. First of all, this research work is based on sample analysis provided by the managers of enterprises in all Pakistani industries manager. This study gives a greater knowledge of how a green innovation approach supports green path innovation finished green organizational uniqueness organizational legality. This education protects both models around the uniqueness and legality of an initiative. This study also assesses the environmental motivations and responses of corporations. It states that managers must try to enhance their performance for green innovation by developing and implementing a green innovation strategy **[94].** Because they know very well about their field and exhibit proficiency in their work, they are appropriate for this research work. However, to generalize the research, we invite academics to evaluate the education but in various districts lengthwise variable concepts.

Using energy-efficient technology can reduce the ratio of pollution and waste produced by the Industry. When environmental concerns become an organization's primary goal, members will be inspired to make additional environmental contributions [95]. The earlier researchers define the identity of green organizations as an emerging framework for eco-friendly management and preservation of the environment that members develop to pile up the values of their operations [96]. Environmental deterioration can endanger organisms and the ecosystem if the environment and natural resources are not protected [97]. In contrast, green innovation suggests prioritizing the mitigation of environmental impacts [98], a System for minimizing waste, preventing pollution, and managing the environment. To gain a competitive advantage, satisfy market demands, and meet stakeholder expectations, encouraging companies to build green innovation strategies to promote green innovation [99].

7. Conclusion

The environmental regulation and management performance on green innovation practices have great effects, now days green environment has become a worldwide slogan for businesses and companies. The enterprise companies must be helpful for new innovative methods for business and environmental issues. This study helps provide the impact of green innovation on other factors customer pressure and pressure from competitors and provides many implications on an administrative level. This study completely reveals the organization type and employee type and some standard factors on study sample-based models just as competitors and shareholders from government or clients, the labor of enterprise, and supplier of raw material. The enterprises should set on green innovation approaches while approaches administrative regulation trend and performance management and industry 5.0 trend and impact of green innovation and third-factor impact on two factors and last factors nature study with proper strategies, companies examined the prototype regarding their products. Last but not least, this study also reveals that employees always have a supporting role in implementing any new approach; in our case, it is "green path innovation."

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